On motion of Professor Bliss the executive committee just formed was directed to appoint a committee of three to report at the first meeting and to present nominations for permanent officers of the Section.

ERNEST B. LYTLE,
Secretary.

BOOK REVIEW.

SEND ALL COMMUNICATIONS TO W. H. BUSSEY, University of Minnesota.

A First Course in Higher Algebra. By HELEN A. MERRILL and CLARA E. SMITH. The Macmillan Company, New York, 1917. xiv + 247 pages. $1.50.

In this work written with the idea that "Higher Algebra, to be worthy of the name, must employ advanced methods," we find the plan well carried out. It is written, too, with the conscious "hope that there is nothing to be unlearned in later work." Not only have the authors succeeded in expressing the material in form which will not have to be unlearned, but this text gives us an illustration of the fact that methods often reserved for advanced work can very profitably be applied to elementary college subjects, to the great advantage of the student for the work in hand as well as for the power gained for more advanced work, by the familiarity, secured here, with methods which will be used on more intricate material in later courses.

While this text omits very little that is given in the usual college algebra, it places before the student, in minimum space and with extreme clearness, most of the usual college algebra material and much of other material often found incidentally by the student in more advanced courses, or not found at all. As an instance of the careful presentation of a subject often slighted, and sometimes omitted, could be mentioned the chapters on the number system. The first of these, the chapter on rational numbers, precedes other work, and contains, in addition to the usual material, some of the simple theorems on integers, which are very useful for factoring; while the chapter on irrational numbers comes later where it can receive a careful treatment by the theory of limits, sufficiently detailed to secure the student a definite and clear understanding.

In the second chapter, which does not differ much from the usual somewhat condensed work on permutations, combinations, and probability, the student begins work on problems of which there is a wholesome number throughout the text. Many of the problems given in various chapters serve for the further development of the text.

While the chapter on determinants is clear and well developed on the whole, articles 48 and 50 suggest conflicting ideas of a minor. It seems to the reviewer somewhat unfortunate that the student is not given a greater familiarity with determinants of order higher than the third, since determinants have so many interesting properties that might well serve as one of the subjects "to arouse curiosity and to lead students to find for themselves what lies just beyond."

It is at this point in the text that the discussion of the theory of limits begins, with a chapter on variables and their limits, followed by a chapter on differentiation of algebraic functions. A clear geometric interpretation of both the first and the second derivative is given, showing the analytical significance of the maximum, the minimum, and the point of inflection. Since the student is here given the condition for maximum and minimum, the condition might well have been used later, on page 210, to determine whether the ordinate of the minimum point of $x^3 - 7x + 7$ is positive or negative, as a preliminary to the discussion of this function by Sturm's theorem.

There follows a chapter on series where the material is advisedly chosen, well presented, and made definite by examples. This chapter gives the student familiarity with the Cauchy test as well as other tests. On this foundation rests the development of functions in series, where undetermined coefficients are treated, and Maclaurin's expansion is used with careful study of the region of convergence. The binomial theorem is shown as a special case. The multinomial theorem is not given. In the treatment of partial fractions a sufficient number of examples is given to secure the desirable dexterity to the prospective student of calculus.

With the theory of limits, series, and convergence in hand, the student is now prepared for the chapter on irrational numbers, wherein the ideas of a dense set and a continuous set are made clear. The existence of non-terminating, non-repeating decimal numbers is shown, and it is explained how a sequence of numbers is said to define an irrational number. On this basis $\sqrt{2}$ is given and a method of finding the value of π is indicated. The sum, difference, product, and quotient of irrational numbers, the power and root of an irrational number, are also defined by sequences. The meaning of an irrational exponent is explained by means of a limit, and given with sufficient detail to make the following chapter on logarithms clear and full of meaning. While e and π are given their classification in the chapter on irrational numbers, it is in the work on logarithms that e is shown to be the $\lim_{n\doteq\infty} [1 + (1/n)]^n$, in which work the student has another opportunity to increase his familiarity with convergence tests.

The derivative of the Naperian logarithm of a function is given, allowing the student a working knowledge of that derivative, which, though all the foundational work on interchange of limits is not included, gives the student the material for securing the logarithmic series by Maclaurin's expansion. Here, again, there arises an opportunity to use the convergence tests to find the region of convergence of the series thus secured. Not only will this chapter probably fulfil the hope of the authors that the "work will help the student to appreciate the labor that has gone into the construction of tables of logarithms," but it must surely also give the student a more accurate idea of the logarithm as a function instead of merely as a mechanical convenience.

In addition to the usual work on complex numbers as to their combination and the geometrical representation of the numbers and of their combinations, the authors prove de Moivre's theorem and give the geometrical interpretation

of powers and roots of complex numbers. The graphing of a function of a complex variable is indicated, as is also the use of complex numbers and the complex variable in series, with graphical illustration of the sequence S_n of a series. Here, as at the end of most chapters, good references are given from which the student may secure further knowledge on the subject treated.

The more or less usual chapter on the theory of equations is given, with an exposition of the theory of Sturm's functions and the approximation of real roots by Horner's method.

At the end of the book there is a very brief chapter on integration as the inverse of differentiation. The reviewer would approve the suggestion of the authors that this chapter "may serve for reference in later work;" for, while the chapter is interesting, it is hardly essential or even useful to the student of algebra. It would, no doubt, be of some use to a student of science, but such student would need so much more thorough work on integration, gained only by more complete study and extended practice with that very important operation, that it might be wise to devote the time which would be required for this chapter to establishing a more thorough acquaintance with material already in hand.

The following misprints were noted:

Page *XIII*, line 15, exponent of x should be $n - 1$ instead of $m - 1$; page 116, equation (2), numerator should be $2 - 3x + 4x^3$ instead of $2 - 3x - 4x^3$; page 121, line 18, read *positive* for *position*; page 156, line 9, read $\Delta y/\Delta x$ instead of $\Delta y/\Delta$; page 234, line 29, read $a_0x^n + a_1x^{n-1}$ instead of $a_0x^n + a_1x^{n-}$.

The material of the text, somewhat out of the usual line, chosen with discrimination, is arranged in a way to render the text easily read and of easy use for reference, thus making the book a valuable addition to the library of the undergraduate for reference, as well as a workable text for a class in the early undergraduate years.

MARY E. WELLS.

VASSAR COLLEGE.

PROBLEMS FOR SOLUTION.

SEND ALL COMMUNICATIONS ABOUT PROBLEMS TO B. F. FINKEL, Springfield, Mo.

2670. Proposed by CLIFFORD N. MILLS, Brookings, S. Dakota.

A telegraph wire, weighing one tenth pound per yard, is stretched between poles on level ground, so that the greatest dip of the wire is 3 feet. Find approximately the distance between the poles when the tension at the lowest point of the wire is 140 pounds.

2671. Proposed by ARTEMAS MARTIN, Washington, D. C.

Find two rectangular parallelopipedons whose edges are rational whole numbers and whose solid diagonals are also rational whole numbers and equal.

2672. Proposed by E. T. BELL, Seattle, Washington.

There is an identity in z, (1) $A(z) \equiv B(z)C(z)$; (*e. g.*, $A(z) = 1/(1 - k^2z^2)$; $B(z) = 1/(1 - kz)$; $C(z) = 1/(1 + kz)$); and the formal expansions $A(z) = \Sigma a(n)z^n$, $B(z) = \Sigma b(n)z^n$, $C(z) = \Sigma c(n)z^n$, $(n = 0, 1, \cdots, \infty)$, when substituted in (1), give, on equating coefficients, (2): $a(n) = b(n)c(0) + b(n-1)c(1) + \cdots + b(0)c(n)$. If (2) is an identity in n, justify such